Factors Associated With the Highest Costs Among US Adults With Primary Biliary Cholangitis

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Conclusions

- Among patients with primary biliary cholangitis (PBC) who were identified in the US HealthVerity database, hepatocellular carcinoma, liver transplantation, and decompensated cirrhosis emerged as costly consequences of PBC, highlighting the value of slowing disease progression with available treatment options
- A few specific comorbidities were most strongly associated with the highest costs; these included rheumatoid arthritis, inflammatory bowel disease, cardiovascular disease, and anaemia
- These results suggest that opportunities to contain costs in PBC may include concurrent optimisation of PBC treatment with the treatment of specific comorbidities
- Because patients with PBC may often have comorbidities that also require treatment, therapy options for PBC that have few drug-drug interactions should be considered

Plain Language Summary

- Primary biliary cholangitis (PBC) is a long-term liver disease that gets worse over time
- Many people with PBC may have other health conditions at the same time
- This study looked at what characteristics led to higher all-cause total healthcare costs in people with PBC
- People with PBC who also had signs that their disease was getting worse, specifically those who had hepatocellular carcinoma, liver transplantation, or decompensated cirrhosis, had higher healthcare costs than people without these signs
- In addition, people with PBC who had other health conditions, specifically rheumatoid arthritis, inflammatory bowel disease, cardiovascular disease, or anaemia, also had higher healthcare costs than people without these conditions

Introduction

- Primary biliary cholangitis (PBC) is a chronic, autoimmune, cholestatic liver disease characterised by the progressive destruction of intrahepatic bile ducts that worsens over time[1]
- Despite the availability of treatments that can reduce the risk of disease progression, without proper treatment, patients with PBC may develop cirrhosis or require a liver transplant[1]
- Patients with PBC have a high burden of comorbidities relative to the general population[2]
- Additionally, PBC is associated with high costs[3]
- Because PBC is a complex disease with many comorbidities, it is important to understand which factors lead to higher costs in these patients

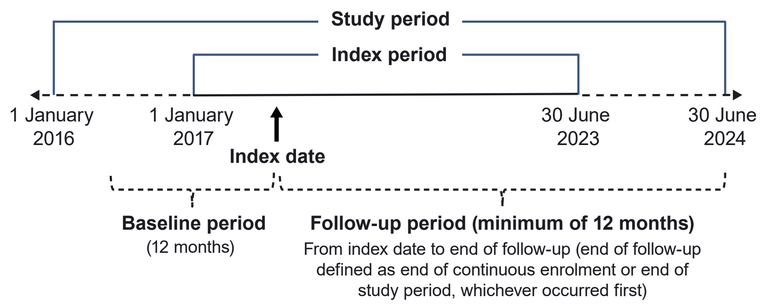
Objective

- Here, we investigated which factors were associated with the highest costs in patients with PBC

Methods

- The US HealthVerity database is a collection of healthcare and consumer data that includes claims from >150 payers across all 50 US states, Puerto Rico, and Washington, DC[4]
  - Approximately 190 million people are included in the database, and it consists of people with commercial insurance and/or Medicare/Medicaid
- This observational, retrospective cohort study used data from the US HealthVerity database between 1 January 2016 and 30 June 2024 to identify adults (aged ≥18 years) diagnosed with PBC (**Figure 1**)
  - Patients with ≥1 inpatient or ≥2 outpatient claims (≥30 days apart) with an *ICD-10-CM* code of K74.3 and continuous health plan enrolment for ≥12 months pre- and post-index were included in the study
  - The index date was defined as the date of the first claim with a PBC diagnosis code

Figure 1. Study Design for Identifying Patients With PBC in the US HealthVerity Database



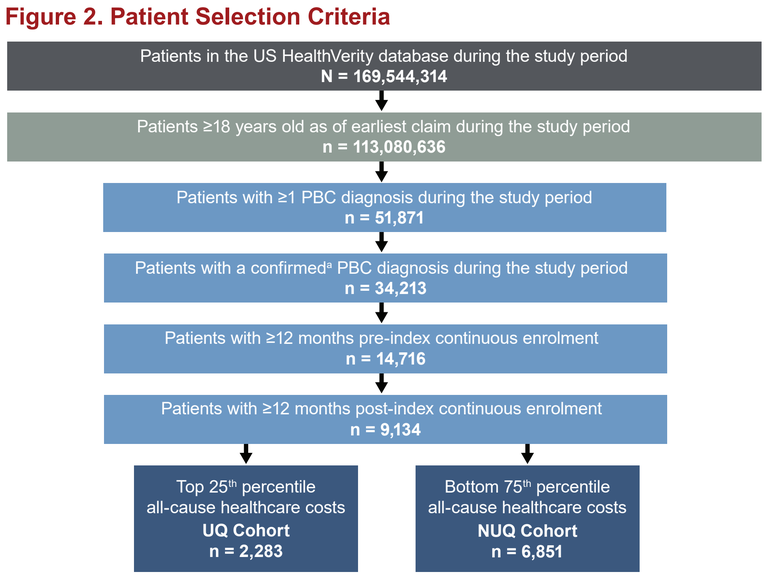
PBC, primary biliary cholangitis.

- Outcomes included 1-year, all-cause healthcare costs during the post-index period and an analysis of factors in the post-index period that were associated with the likelihood of having higher all-cause costs
  - All-cause healthcare costs (in 2024 US dollars) were tabulated using total allowable charges from medical (inpatient and outpatient) and pharmacy claims; these were obtained for the overall population of patients with PBC
  - Patients were then divided into 2 cohorts based on who was in the top 25th percentile for all-cause healthcare costs; these patients were included in the upper quartile (UQ) cohort, and the remaining patients were included in the non-UQ (NUQ) cohort
    - The algorithm used to identify and calculate inpatient costs was updated to better align with the structure of claim source data. This adjustment was necessary to ensure accurate calculation of the patient total costs and their subsequent cohort assignment
  - A simultaneous backward and forward stepwise selection logistic regression model was used to evaluate demographic and clinical factors in the post-index period that were associated with higher all-cause costs
    - This model included variables studied descriptively regardless of statistical significance level from the bivariate comparison between the 2 cohorts

Results

- Of the 169,544,314 patients in the US HealthVerity database during the study period, 9,134 patients with PBC met the inclusion criteria (**Figure 2**)

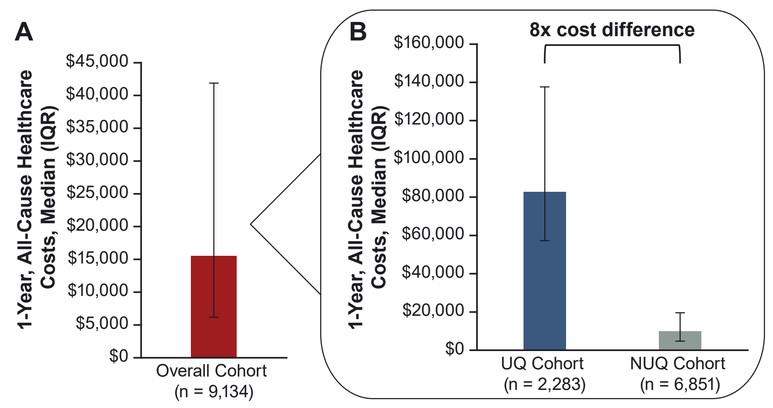
Figure 2. Patient Selection Criteria



[a]Patients with ≥1 inpatient or ≥2 outpatient claims (≥30 days apart) with an *ICD-10-CM* code of K74.3 were included.
ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification; NUQ, non–upper quartile; PBC, primary biliary cholangitis; UQ, upper quartile.

Results

Figure 3. Median (IQR) 1-Year, All-Cause Healthcare Costs (2024 US Dollars) in the Overall (A), UQ, and NUQ Cohorts (B)*



The UQ cohort represents patients who were in the top 25th percentile for all-cause healthcare costs, while the NUQ cohort represents those who were in the bottom 75th percentile.
*Results differ from the submitted abstract.
IQR, interquartile range; NUQ, non–upper quartile; UQ, upper quartile.

- In the overall cohort of 9,134 patients with PBC, median (IQR) 1-year, all-cause healthcare costs were $15,523 ($6,165–$41,882; **Figure 3A**)
  - Patients in the top 25th percentile for all-cause healthcare costs were included in the UQ cohort (n = 2,283), and the remaining patients in the bottom 75th percentile were included in the NUQ cohort (n = 6,851)
- In the overall cohort, mean (SD) 1-year, all-cause healthcare costs were $42,119 ($111,399)
- Median 1-year, all-cause healthcare costs were 8-fold higher in the UQ cohort compared with the NUQ cohort (**Figure 3B**), with median (IQR) 1-year, all-cause costs of $82,799 ($57,275–$137,614) in the UQ cohort vs $9,908 ($4,731–$19,618) in the NUQ cohort
- Mean (SD) 1-year, all-cause healthcare costs were $128,736 ($198,299) in the UQ cohort and $13,255 ($10,601) in the NUQ cohort

Table 1. Demographics in the Overall, UQ, and NUQ Cohorts of Patients With PBC*

Characteristic	Overall Cohort (n = 9,134)	UQ Cohort (n = 2,283)	NUQ Cohort (n = 6,851)	*P*-Value
Age at index, years, mean (SD)	55 (13.9)	54 (14.6)	55 (13.6)	.0091
Female, n (%)	7,526 (82)	1,699 (74)	5,827 (85)	<.0001
Payer Type, n (%)				
Commercial	4,544 (50)	920 (40)	3,624 (53)	<.0001
Medicaid	2,374 (26)	776 (34)	1,598 (23)	<.0001
Medicare	1,673 (18)	447 (20)	1,226 (18)	.0716
Unknown	543 (6)	140 (6)	403 (6)	.6618

*Results differ from the submitted abstract.
NUQ, non–upper quartile; PBC, primary biliary cholangitis; UQ, upper quartile.

- In the overall cohort (n = 9,134), mean (SD) age was 55 (14) years, and most patients were female (82%) and commercially insured (50%; **Table 1**)
- In the UQ cohort (n = 2,283), fewer patients were female (74% vs 85%) or commercially insured (40% vs 53%) compared with patients in the NUQ cohort

Table 2. 12-Month Post-Index Comorbidities in the Overall, UQ, and NUQ Cohorts of Patients With PBC*

Characteristic	Overall Cohort (n = 9,134)	UQ Cohort (n = 2,283)	NUQ Cohort (n = 6,851)	*P*-Value
Comorbidities, n (%)	GERD			
Hypertension	5,518 (60)	1,735 (76)	3,783 (55)	<.0001
Dyslipidaemia	4,969 (54)	1,327 (58)	3,642 (53)	<.0001
Arthralgias/bone pain	4,444 (49)	1,345 (59)	3,099 (45)	<.0001
GERD	3,865 (42)	1,289 (56)	2,576 (38)	<.0001
Depression/anxiety	3,703 (41)	1,268 (56)	2,435 (36)	<.0001
Abdominal pain	3,701 (41)	1,436 (63)	2,265 (33)	<.0001
Anaemia	3,392 (37)	1,617 (71)	1,775 (26)	<.0001
Cardiovascular disease	3,097 (34)	1,416 (62)	1,681 (25)	<.0001
Fatigue	2,983 (33)	1,270 (56)	1,713 (25)	<.0001
Cigarette smoking	2,802 (31)	1,065 (47)	1,737 (25)	<.0001
Type 2 diabetes	2,659 (29)	959 (42)	1,700 (25)	<.0001
Chronic kidney disease	2,517 (28)	1,132 (50)	1,385 (20)	<.0001
Sleep-related disorders	2,137 (23)	826 (36)	1,311 (19)	<.0001
Renal insufficiency	2,125 (23)	1,151 (50)	974 (14)	<.0001
Recurrent UTI	2,046 (22)	858 (38)	1,188 (17)	<.0001
Diarrhoea	1,624 (18)	806 (35)	818 (12)	<.0001
Osteoporosis/osteopenia	1,442 (16)	476 (21)	966 (14)	<.0001
Autoimmune hepatitis	1,327 (15)	383 (17)	944 (14)	<.0001
Pruritus	1,110 (12)	412 (18)	698 (10)	<.0001
COVID-19	924 (10)	339 (15)	585 (9)	<.0001
Alcohol	883 (10)	473 (21)	410 (6)	<.0001
Hepatomegaly	740 (8)	316 (14)	424 (6)	<.0001
Rheumatoid arthritis	671 (7)	293 (13)	378 (6)	<.0001
Substance abuse	601 (7)	304 (13)	297 (4)	<.0001
Inflammatory bowel disease	530 (6)	278 (12)	252 (4)	<.0001
Jaundice	512 (6)	320 (14)	192 (3)	<.0001
Systemic lupus erythematosus	400 (4)	143 (6)	257 (4)	<.0001
Splenomegaly	247 (3)	127 (6)	120 (2)	<.0001
Autoimmune haemolytic anaemia	77 (1)	45 (2)	32 (<1)	<.0001

*Results differ from the submitted abstract.
GERD, gastro-oesophageal reflux disease; NUQ, non–upper quartile; PBC, primary biliary cholangitis; UTI, urinary tract infection; UQ, upper quartile.

- Generally, patients in the UQ cohort had more comorbidities than patients in the NUQ cohort (**Table 2**)
  - For example, anaemia (UQ = 71%; NUQ = 26%), cardiovascular disease (CVD; UQ = 62%; NUQ = 25%), rheumatoid arthritis (RA; UQ = 13%; NUQ = 6%), and inflammatory bowel disease (IBD; UQ = 12%; NUQ = 4%) were more common among patients in the UQ cohort than among those in the NUQ cohort

Table 3. 12-Month Post-Index Liver Disease and Liver Testing in the Overall, UQ, and NUQ Cohorts of Patients With PBC*

Characteristic	Overall Cohort (n = 9,134)	UQ Cohort (n = 2,283)	NUQ Cohort (n = 6,851)	*P*-Value
Liver disease, n (%)				
Cirrhosis	4,463 (49)	1,780 (78)	2,683 (39)	<.0001
Compensated cirrhosis	3,873 (42)	1,540 (67)	2,333 (34)	<.0001
Decompensated cirrhosis	2,589 (28)	1,437 (63)	1,152 (17)	<.0001
Liver transplantation	522 (6)	390 (17)	132 (2)	<.0001
Hepatocellular carcinoma	218 (2)	150 (7)	68 (1)	<.0001
Ascites	1,338 (15)	901 (39)	437 (6)	<.0001
Hepatic failure	1,337 (15)	884 (39)	453 (7)	<.0001
Oesophageal varices	1,330 (15)	706 (31)	624 (9)	<.0001
Liver testing, n (%)				
Ultrasound	4,001 (44)	1,397 (61)	2,604 (38)	<.0001
FibroScan	928 (10)	147 (6)	781 (11)	<.0001

*Results differ from the submitted abstract.
NUQ, non–upper quartile; PBC, primary biliary cholangitis; UQ, upper quartile.

- Evidence of progressive liver disease, such as decompensated cirrhosis (UQ = 63%; NUQ = 17%), liver transplantation (UQ = 17%; NUQ = 2%), and hepatocellular carcinoma (UQ = 7%; NUQ = 1%), also occurred more frequently in patients in the UQ cohort compared with those in the NUQ cohort (**Table 3**)

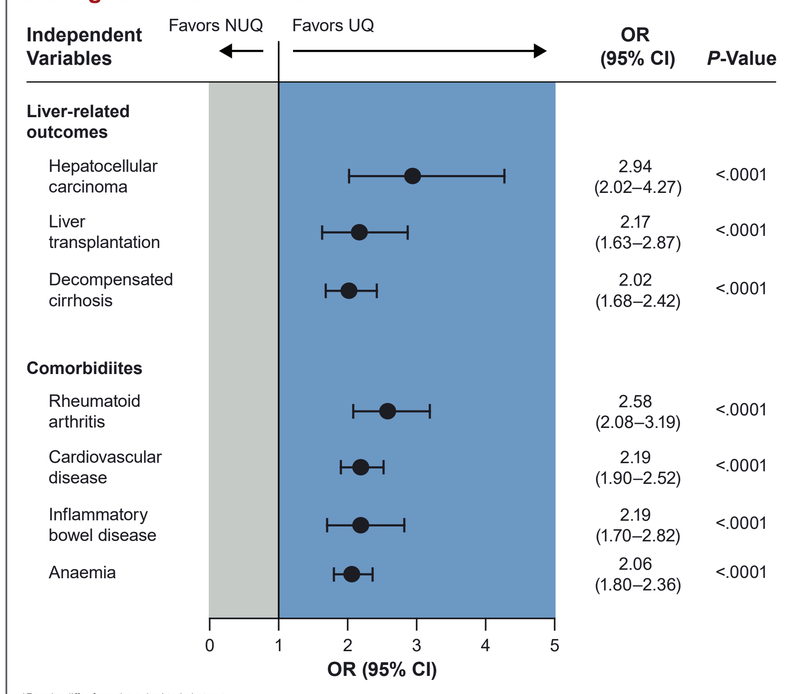
Table 4. Evidence of Treatment During the 12-Month Post-Index Period in the Overall, UQ, and NUQ Cohorts of Patients With PBC*

Characteristic	Overall Cohort (n = 9,134)	UQ Cohort (n = 2,283)	NUQ Cohort (n = 6,851)	*P*-Value
Concomitant medications, n (%)	Pruritus			
Pruritus	1,205 (13)	485 (21)	720 (11)	<.0001
Posthormonal therapy	411 (5)	195 (9)	216 (3)	<.0001
Evidence of a PBC treatment post-index, n (%)				
Ever treated patients with approved Rx (UDCA or OCA)	5,890 (64)	1,385 (61)	4,505 (66)	<.0001
Never treated patients with approved Rx (UDCA or OCA)	3,244 (36)	898 (39)	2,346 (34)	<.0001
Ever treated patients with any PBC Tx (UDCA, OCA, or fibrates)	5,922 (65)	1,400 (61)	4,522 (66)	<.0001
Never treated patients with any PBC Tx (UDCA, OCA, or fibrates)	3,212 (35)	883 (39)	2,329 (34)	<.0001

*Results differ from the submitted abstract.
NUQ, non–upper quartile; OCA, obeticholic acid; PBC, primary biliary cholangitis; Rx, prescription; Tx, treatment; UDCA, ursodeoxycholic acid; UQ, upper quartile.

- Patients in the UQ cohort were also on more concomitant medications, such as pruritus and posthormonal therapies, than were patients in the NUQ cohort (**Table 4**)

Figure 4. Logistic Regression Results of Factors Associated With the Highest Costs in PBC*



*Results differ from the submitted abstract.
NUQ, non–upper quartile; OR, odds ratio; PBC, primary biliary cholangitis; UQ, upper quartile.

- Presence of hepatocellular carcinoma, RA, CVD, IBD, liver transplantation, anaemia, and decompensated cirrhosis increased the odds of being in the UQ cohort by 194%, 158%, 119%, 119%, 117%, 106%, and 102%, respectively (**Figure 4**)

Strengths and Limitations

- These analyses were conducted among a large, representative sample of individuals with PBC in the US
- Claims data are inherently limited by the retrospective nature of the data, coding errors or missing information, and coverage and benefit restrictions
- Only associations and not causality can be determined from the results
- Only the total allowable charge was reported, whereas the actual total paid amount could be overrepresented or underrepresented depending on reimbursement and direct patient payments
- Laboratory costs for liver biomarker testing were not included, but they will be accounted for in future studies
- Some of the comorbidities are not related to PBC

References: 1. European Association for the Study of the Liver. *J Hepatol*. 2017;67(1):145-72. **2.** Gungabissoon U, et al. *BMJ Open Gastroenterol*. 2022;9:e000857. **3.** Gish RG, et al. *J Comp Eff Res*. 2025;14(4):e240174. **4.** HealthVerity. Updated 2025. Accessed August 18, 2025. https://healthverity.com/.

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